distinctive characters. No known notodelphyid antenna shows the subdivision of the terminal portion into the clear-cut segments found throughout the cyclopinids and archinotodelphyids. The extremely high development of the terminal prehensile hook of notodelphyids is not equalled in the other groups. The maxilliped presents a difference of organization, especially with regard to the profuse setal armature on the basal segment in the notodelphyid. The fifth legs are distinctive in basic plan. Finally, the dorsal brood pouch is a feature which is universal in notodelphyids and unknown in the other groups. This series remains then a fairly strongly separated one.

A final consideration must be added. Lindberg's classification was proposed without his having opportunity to consider thoroughly the family Archinotodelphyidae (cf. Lindberg, 1952, footnote, p. 318). This family is now on the record and the definition is an adequate one. The addition of a new species has demonstrated, in the reappraisal of defining characters that there is strong evidence for a natural group here, defined by a complex of characters. The characters show overlapping in two directions, some occurring in the antecedent group, some in the descendent family. No purely archetypical species occurs in any one of the 3 separable lineages. Nor does there occur an actual transitional species for either of the gaps in continuity of distribution of the characters. The belated recognition of the existence of cyclopinids as forerunners of notodelphyids and the recent discovery of the archinotodelphyids combine to bring about the situation where the ultimate offshoot group is much better known anatomically and the range of variations more exhaustively explored than is the case for the parental series. Further, the number of genera and of species described in the notodelphyids exceeds those of both the other families. On the basis of these features, with the strongly reenforcing conviction that a considerable majority of species remains undiscovered in this whole assemblage, the present treatment then maintains the separation of the 3 families.

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ZOOLOGY.—*The isopod genus* Chiridotea *Harger, with a description of a new species from brackish waters.*

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During the examination of samples collected by the Shad Investigations of the U. S. Fish and Wildlife Service from 1937 to 1941, numerous specimens of an undescribed valviferous isopod of the genus *Chiridotea* Harger, 1878, were discovered. In this paper the new species is described, and certain additions and corrections are made to published accounts of the two previously known species of the genus.

[1] Published by permission of the Secretary of the Smithsonian Institution.

Chiridotea Harger, 1878

Examination of the three species has made it possible to give the following revised definition of the genus (family and subfamily characters omitted):

Mandible without molar. Inner lobe of first maxilla bearing one long, plumose seta and a minute seta. Palp of maxilliped formed of three segments; lateral margins of the two distal segments fringed with fine setae. Epimeral plates distinct on pereion somites 2–7, their free margins spinose. Propodus of pereiopod 1 somewhat larger than that of pereiopod 2 or 3. Pereiopods 1–5 of female with oostegites. Pleotelson composed of four somites, with lateral sutures of another partially coalesced somite. Medial sternal process of first somite of pleon bearing long spines. Inner ramus of uropod about half or a little more than half as long as outer ramus. Type, by original designation, *C. coeca* (Say).

Members of this genus are small species, known only from the east coast of the United States and Canada, from Florida to Nova Scotia, on sandy bottoms.

The most closely related genus, *Saduria* Adams,[2] differs from *Chiridotea* in that the mandible possesses a molar; the inner lobe of the first maxilla bears two long setae and a minute seta; the palp of the maxilliped is formed of 5 segments; the propodus of pereiopod 1 is about the same size as those of pereiopods 2 and 3; the inner ramus of the uropod is much less than half as long as the outer ramus. Members of this genus are large species, limited to arctic and subarctic waters.

KEY TO THE SPECIES OF CHIRIDOTEA

1. Flagellum of antenna 2 much shorter than peduncle, 5 segmented; antenna 1 nearly as long as antenna 2 ..... *C. coeca*
   Flagellum of antenna 2 longer than peduncle, 8–12 segmented; antenna 1 much shorter than antenna 2 2
2. Posterior margin of dactyl of pereiopod 1 armed with strong spines; pleotelson as in Fig. 2 *j* ..... *C. tuftsi*
   Posterior margin of dactyl of pereiopod 1 armed with a few setae; pleotelson as in Fig. 1 *a* ..... *C. almyra*, n. sp.

[2] The name *Mesidotea* Richardson, 1905, now commonly applied to this genus, can no longer be used, since there are two older available names: *Idotaega* Lockington, 1876, p. 44, and *Saduria* Adams, in Sutherland, 1852, appendix, p. cevii.

Chiridotea coeca (Say)

Fig. 2, *b*, *c*, *i*

Idotea cocca Say, 1818, pp. 424–425.—Gould, 1841, p. 337.
Idotaea caeca Say, Gould, in Hitchcock, 1835, p. 29.
Idotea cacca Say, Milne-Edwards, 1840, p. 131.—Guérin-Méneville, 1843, p. 35.—DeKay, 1844, p. 42.—White, 1847, p. 94.—Verrill and Smith, 1874, p. 340 (46), 569 (275), pl. 5, fig. 22.
Chiridotea coeca (Say), Harger, 1878, p. 374; 1879, p. 159; 1880, pp. 338–340, pl. 4, fig. 16–19.—Richardson, 1901, p. 539.
Chiridotca coecas (Say), Richardson, 1900, p. 226.
Chiridotea caeca (Say), Richardson, 1905, pp. 353–354, fig. 380–381.—Racovitza and Sevastos, 1910, p. 195.—Collinge, 1918, pp. 73–74, pl. 7, fig. 1.
Glyptonotus caecus (Say), Miers, 1881, pp. 17–18.

Diagnosis.—Lateral margins of head with U- or V-shaped clefts, the anterior margins of the clefts often bearing plumose setae; head produced into quadrate lobes anterior to the clefts. Antenna 2 only slightly longer than antenna 1; flagellum with 5 segments. Propodus of pereiopod 1 more robust than in the other species; greatest width a little more than ⅔ the length; lateral surface bearing a few long setae. Pleotelson narrowing gradually in basal half, more abruptly in terminal half. Length, excluding antennae, up to 13 mm.

Range.—From Florida to Halifax, Nova Scotia, on sand bottoms, usually intertidally, but occasionally found as deep as 17 fm. The collections of the National Museum contain specimens from as far south as Beaufort, North Carolina. Inclusion of Florida in the range is based on Say's statement, "... found as far south as Florida." Say gave no information about the type locality.

Chiridotea tuftsi (Stimpson)

Fig. 2, *a*, *c*, *j*

Idotea tuftsii Stimpson, 1883, p. 39.—Verrill and Smith, 1874, p. 340 (46), 569 (275).—Verrill, 1874, p. 362.
Chiridotea tuftsii (Stimpson), Harger, 1878, p. 374; 1879, p. 159; 1880, p. 340–341, pl. 4, fig. 20–23.—Richardson, 1900, p. 226; 1901, p. 539; 1905, p. 354–355, fig. 382–383.—Racovitza and Sevastos, 1910, p. 195.—Collinge, 1918, p. 74, pl. 7, fig. 2.
Glyptonotus tuftsii (Stimpson), Miers, 1881, p. 18–19.

Diagnosis.—Lateral margins of head with V-shaped clefts; head produced into quadrate lobes anterior to the clefts. Antennae 2 more than twice as long as antenna 1; flagellum of 11–12

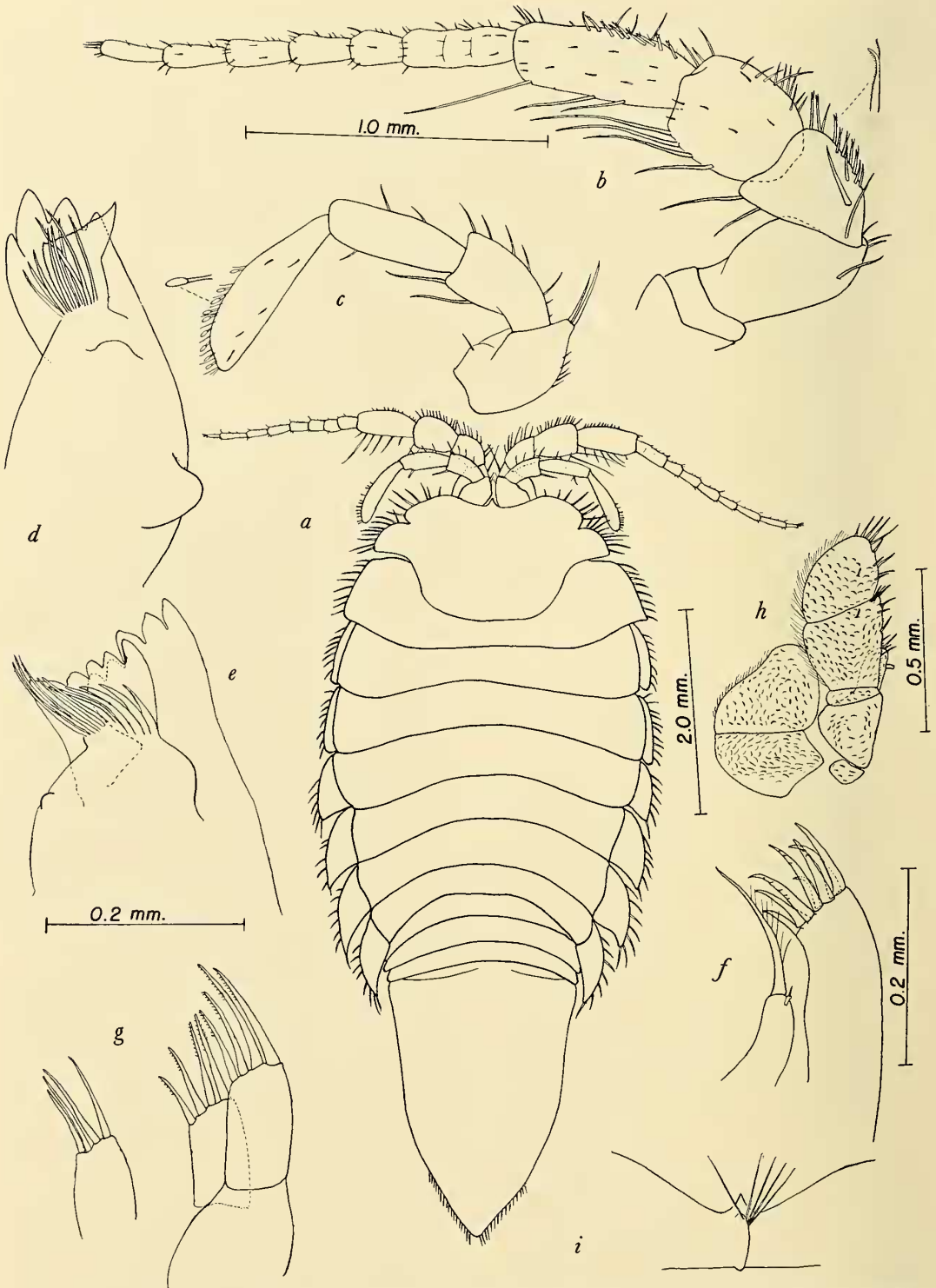

FIG. 1.—*Chiridotea almyra*, n. sp., male paratype: *a*, Dorsal view of entire animal; *b*, antenna 2, dorsal; *c*, antenna 1, dorsal; *d*, right mandible, distal portion; *e*, left mandible, distal portion; *f*, maxilla 1; *g*, maxilla 2, inner plate displaced; *h*, maxilliped; *i*, penis and medial sternal process of first somite of pleon, ventral view. *b* and *c*, same scale; *d*–*g*, same scale.

segments. Propodus of pereiopod 1 a little more than half as wide as long, lateral surface with a few short spines; dactyl armed with strong spines on posterior margin, the distal ones longer. Pleotelson tapering evenly from base to posterior end, so that its basal half appears relatively

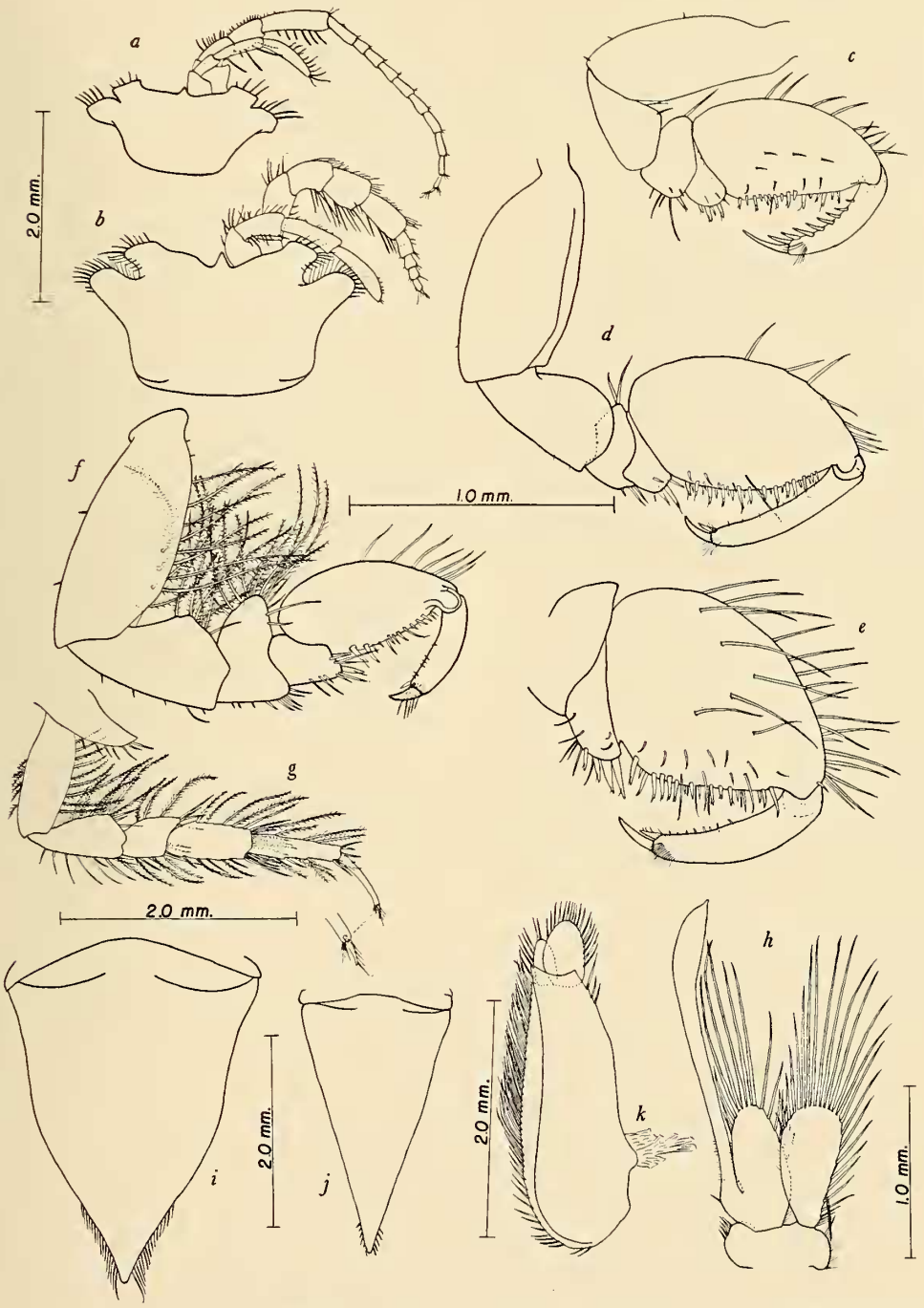

FIG. 2.—*Chiridotea almyra*, n. sp., male paratype; *C. coeca* (Say), male, from Cohasset, Mass., U.S. N.M. no. 30195; *C. tuftsi* (Stimpson), male, from S.E. Amherst Island, Gulf of St. Lawrence, U. S. N. M. no. 63744: *a*, *C. tuftsi*, head, dorsal view; *b*, *C. coeca*, head, dorsal view; *c*, *C. tuftsi*, pereiopod 1; *d*, *C. almyra*, pereiopod 1; *e*, *C. coeca*, pereiopod 1, distal segments; *f*, *C. almyra*, pereiopod 2; *g*, *C. almyra*, pereiopod 7; *h*, *C. almyra*, pleopod 2; *i*, *C. coeca*, terminal part of pleotelson; *j*, *C. tuftsi*, terminal part of pleotelson; *k*, *C. almyra*, uropod. *c–f*, same scale; *i–j*, same scale.

narrower than in the other two species. Length, excluding antennae, 5–6 mm.

Range.—Long Island Sound to the Gulf of Saint Lawrence (Amherst Island). The type was dredged in 10 fathoms, off Cheney's Head, Grand Manan Island, New Brunswick. *C. tuftsi* inhabits deeper water than *C. coeca*, being found in bottoms of fine, uniform sand (Tait, 1927), from the level of low tide to a depth of 30 fathoms.

Chiridotea almyra,[3] n. sp.

Fig. 1, *a–i*; fig. 2, *d*, *f*, *g*, *h*, *k*

Diagnosis.—Lateral margins of head divided by V-shaped clefts; anterior to the clefts the head is evenly rounded, not produced into quadrate lobes. Antenna 2 about twice as long as antenna 1; flagellum of 7–9 segments. Propodus of pereiopod 1 a little more than half as wide as long; lateral margin devoid of spines; dactyl with a few small setae on posterior margin. Sides of pleotelson almost parallel for more than half their length, then converging gradually; posterior end more broadly rounded than in the other species. Length, excluding antennae, 4.5–6.5 mm.

Color (after 14 years in formalin).—Dorsal and ventral surfaces of body, antennae 1 and 2, proximal segments of pereiopods, and uropods covered with black chromatophores.

Types, deposited in the U. S. National Museum.—Holotype, adult male, 5.8 mm in length, no. 96960; allotype, female with oostegites developed, 4.6 mm in length, no. 96961 and 44 paratypes, no. 96962, all from a 1-meter net haul made at Willtown Bluff, Edisto River, S. C., April 1, 1940.

Remarks.—The cuticle of the body and appendages is sculptured as shown in the drawing of the maxilliped. Young specimens, 2.6 mm in length, have 3-segmented maxillipedal palps as in the adult. Pereiopod 3 resembles pereiopod 2 in all details. Pereiopods 4–6 resemble pereiopod 7; pereiopods 5 and 7 are about equally long, somewhat longer than pereiopod 4, but shorter than pereiopod 6. Both lobes of pleopods 1 and 2 and the exopod of pleopod 3 are natatory, bearing plumose setae on their margins; the endopod of pleopod 3 and both lobes of pleopods 4 and 5 are respiratory in function. This division of the pleopods is found throughout the genera *Chiridotea* and *Saduria*. In very young specimens of *C. almyra*, the second antennae are not nearly as much longer than the first antennae as they are in mature specimens. This might lead to confusion with young specimens of *C. coeca*, but the two species can be easily separated by the difference in shape of the pleotelson.

In addition to the type locality I have identified *C. almyra* from Kings Ferry, Ogeechee River, Ga., and from two localities in the Hudson River, N. Y., near Barrytown and Haverstraw, respectively.

The salinity must be very low at all these localities, since they are well upstream from the river mouths, but I unfortunately have no data on the salinity at the sites of collection. In the samples collected at Willtown Bluff and Kings Ferry, a number of species known to be euryhaline and frequently found in brackish water were present. These include the copepod *Eurytemora hirundoides* Nordquist, the amphipod *Corophium lacustre* Vanhoffen, the isopod *Cyathura carinata* (Krøyer), and the polychaete *Scolelepides viridis* (Verrill).[4] In addition, the freshwater copepods *Osphranticum labronectum* Forbes and species of *Diaptomus*, *Cyclops*, and *Macrocyclops* were present. Taken at Haverstraw were such brackish-water forms as the amphipods *Leptocheirus plumulosus* Shoemaker and *Corophium lacustre* Vanhoffen, and the isopod *Cyathura carinata* Krøyer.

Chiridotea almyra is clearly limited to water of low salinity, and perhaps even enters fresh water. The strictly marine species, *C. coeca* and *C. tuftsi*, are scavengers on sandy bottoms, where they burrow just beneath the surface of the sand (Tait, 1927). Presumably *C. almyra* has a similar way of life in its brackish environment.

DISCUSSION

Of the mouthparts of *Chiridotea*, only the maxillipeds have been previously figured. Both Harger and Richardson illustrate the palp as 3-segmented; Collinge shows the palp as 3-segmented in *C. coeca*, 4-segmented in *C. tuftsi*. I have examined maxillipeds from both species and found only 3-segmented palps. It is likely that Collinge's specimen of *C. tuftsi* was anomalous. The fine setae on the outer margins of the palp are shown by Harger, but not by the other authors.

The remaining mouthparts are similar in all three species of *Chiridotea*. The presence of a single seta on the inner lobe of the first maxilla is, as far as I know, unique among idotheid genera.

[3] From the Greek αλμυρὸς, brackish.

[4] Identified by Marian H. Pettibone.

The absence of a molar on the mandible is also an unusual feature.

Although both *C. coeca* and *C. tuftsi* are reported to have eyes on the dorsal surface of the head, medial to the lateral incisions, I have been unable to find them in either of these species or in *C. almyra*. This is undoubtedly due to the action of the preservative, for eyes were noticed in living specimens by Tait (1927) in his interesting paper on the natural history of *C. coeca* and *C. tuftsi*.

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LETTERS TO THE EDITOR

*The Electrometer at High Frequencies.**

It is not generally appreciated, I think, that the quadrant (or string) electrometer is a useful instrument at high frequencies, although this was suggested as early as 1881 by Ayrton and Fitzgerald, and also by Potier (see "Electrometer," Encyclopedia Britannica, 11th ed). So far as I am aware the use of electrometers on a-c has been restricted to power measurements at line frequencies. This application is described in the standard books on electrical measurements (e.g., Laws, Michals, Harris). The high resistance and low capacity of an electrometer suggest an extension of its use to the megacycle range.

We denote the potentials of the two fixed members (plates) by A and B, and that of the needle by N, all with respect to the

* Received May 27, 1955.